FIG. 1

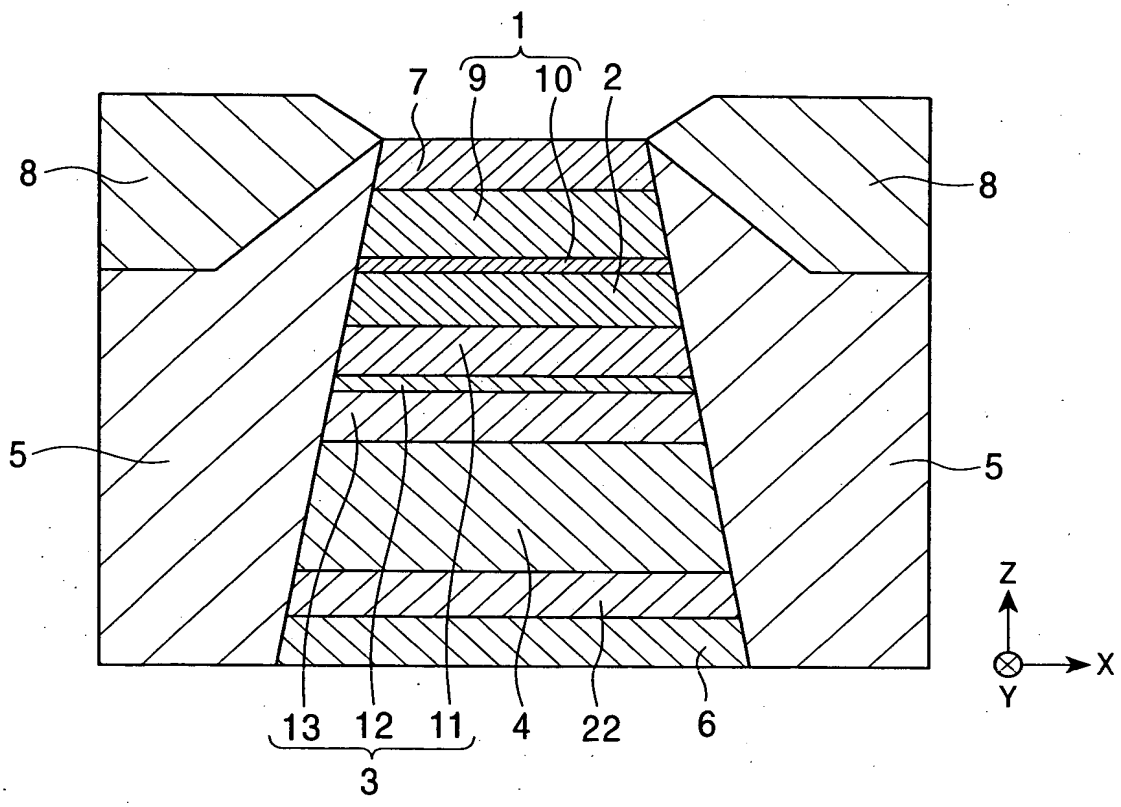


FIG. 2

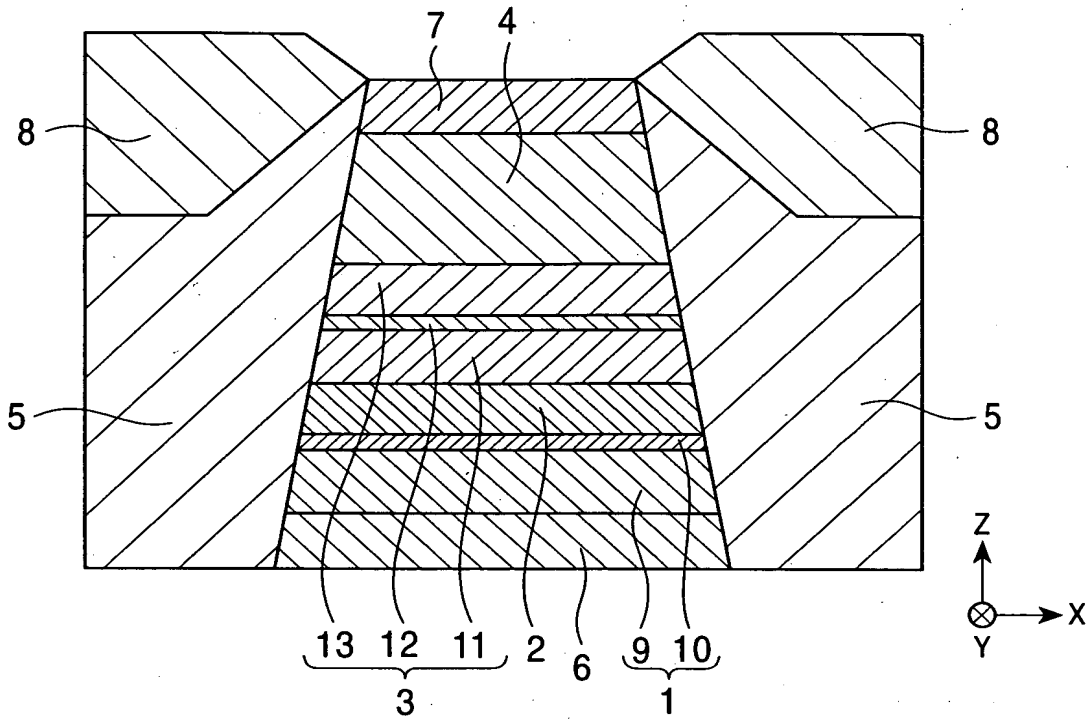


FIG. 3

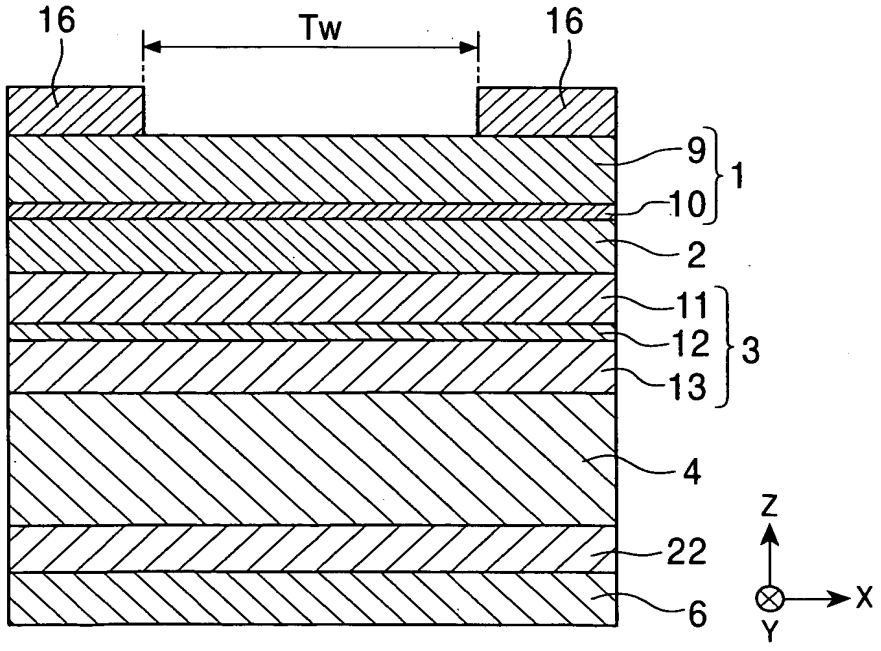


FIG. 4

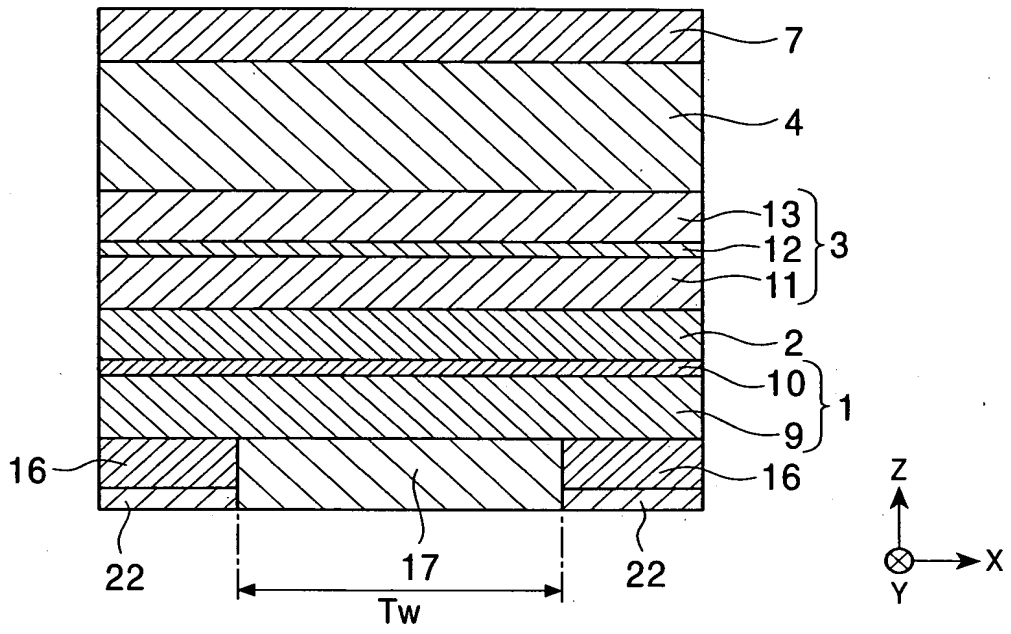


FIG. 5

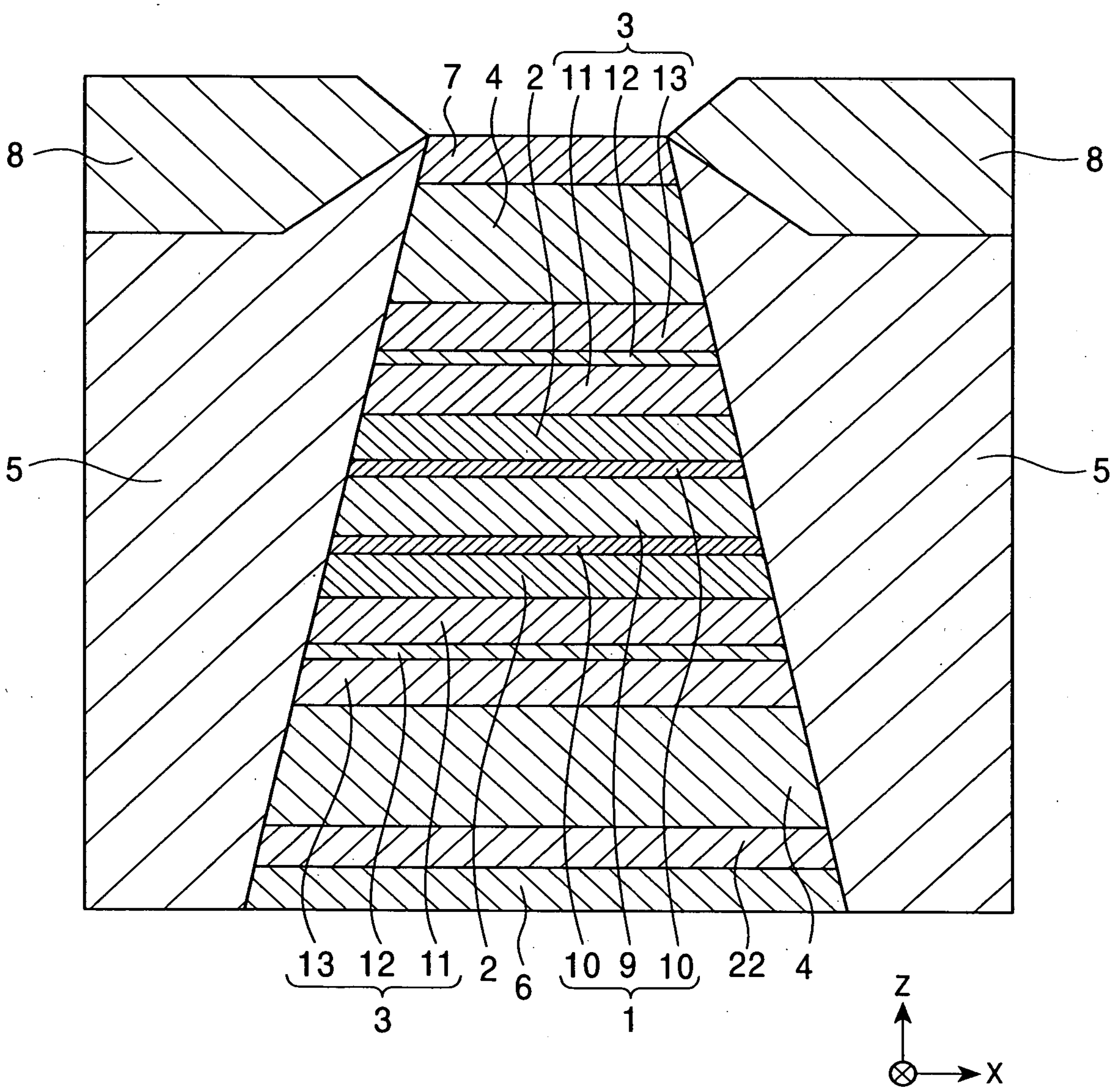


FIG. 6

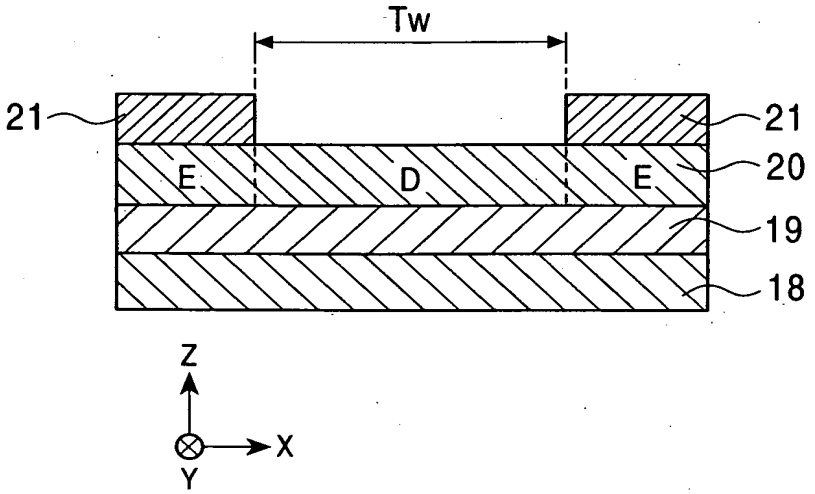


FIG. 7

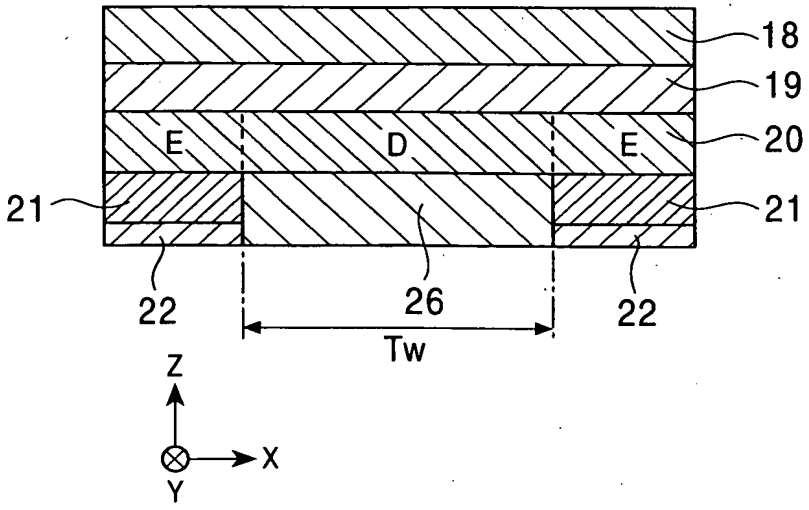


FIG. 8

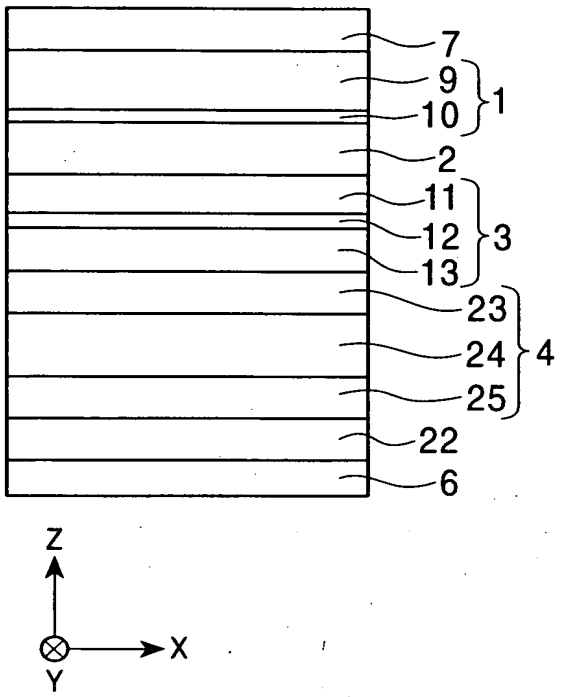


FIG. 9

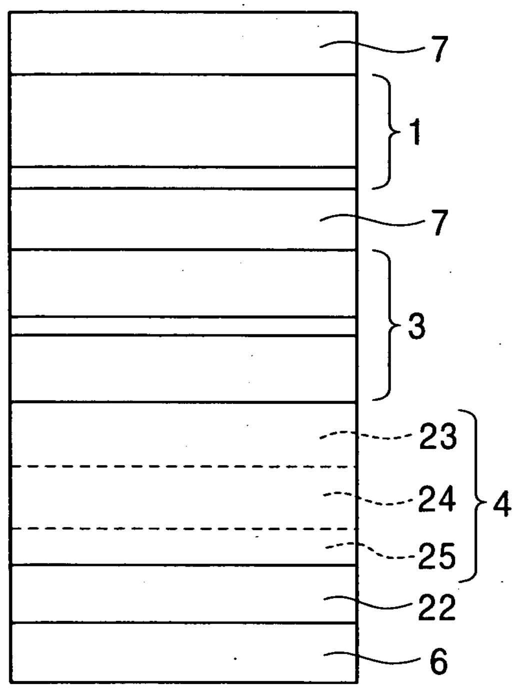


FIG. 10

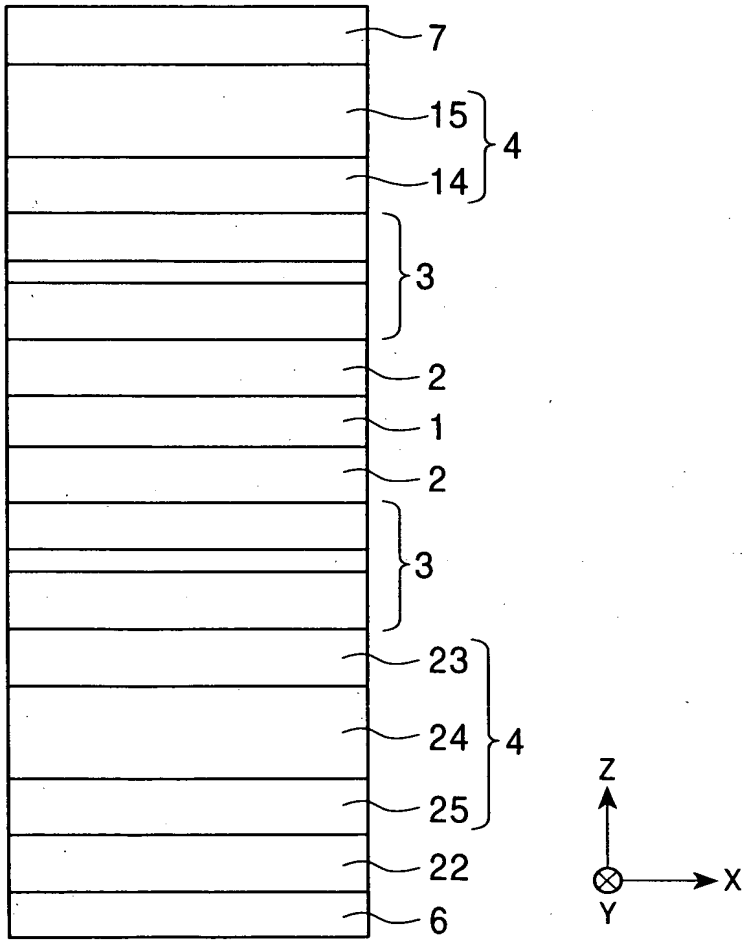


FIG. 11

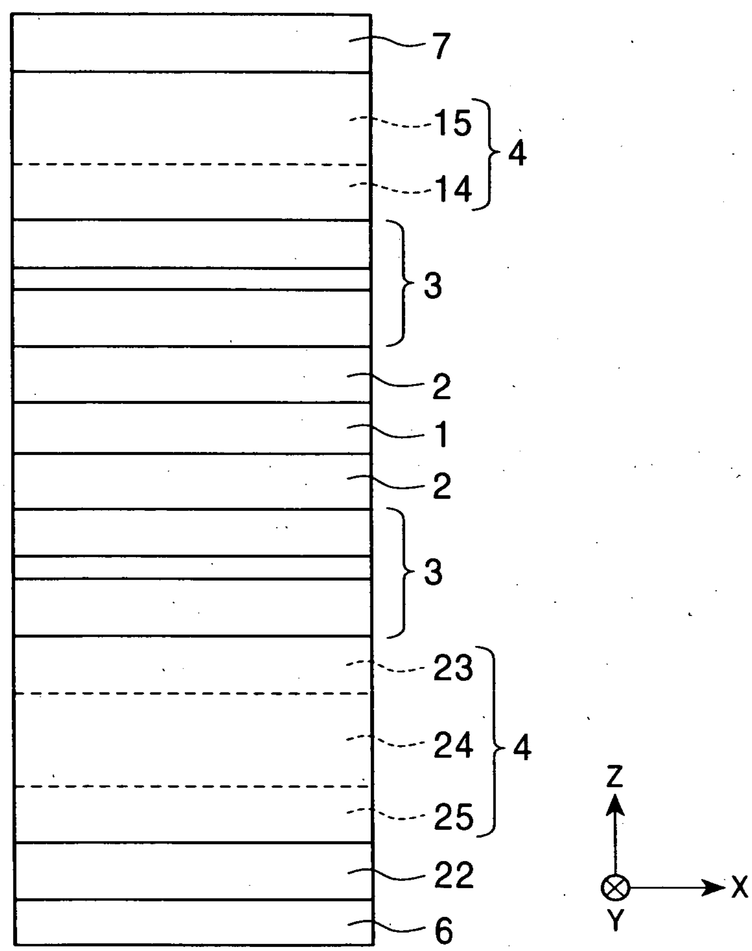


FIG. 12

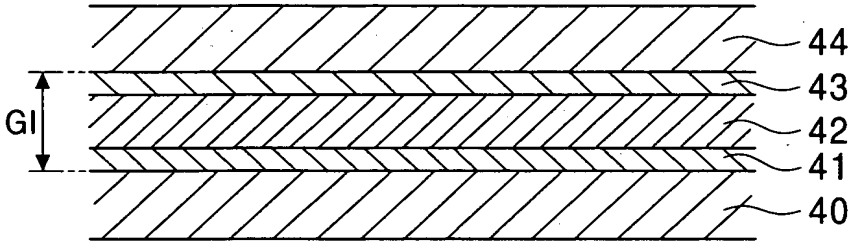
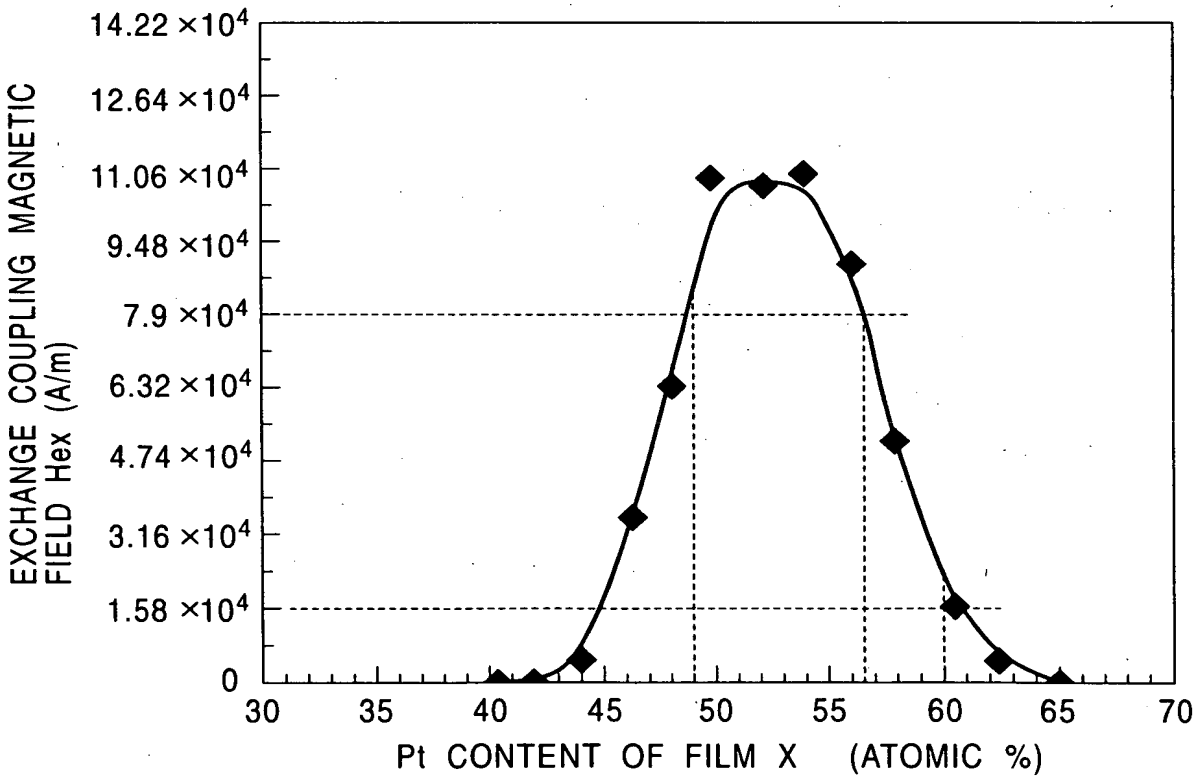


FIG. 13



FILM STRUCTURE: Si SUBSTRATE/ALUMINA/Ta(3nm)/NiFe (3nm)/PtMn(15nm)/Co (1.5nm)/Ru(0.8nm)/Co (2.5nm)/Cu(2.3nm)/Co (1nm)/NiFe(3nm)/Cu(1.5nm)/Ta(3nm)

FIG. 14

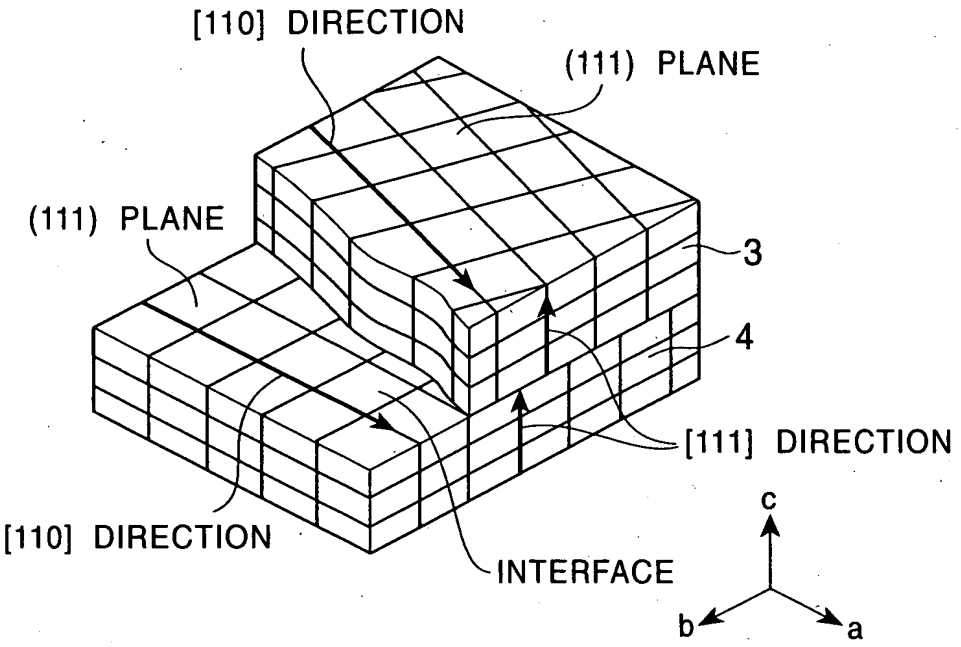

[110] DIRECTION
(111) PLANE
(111) PLANE
3
4
[111] DIRECTION
[110] DIRECTION
INTERFACE
c
b
a

FIG. 15

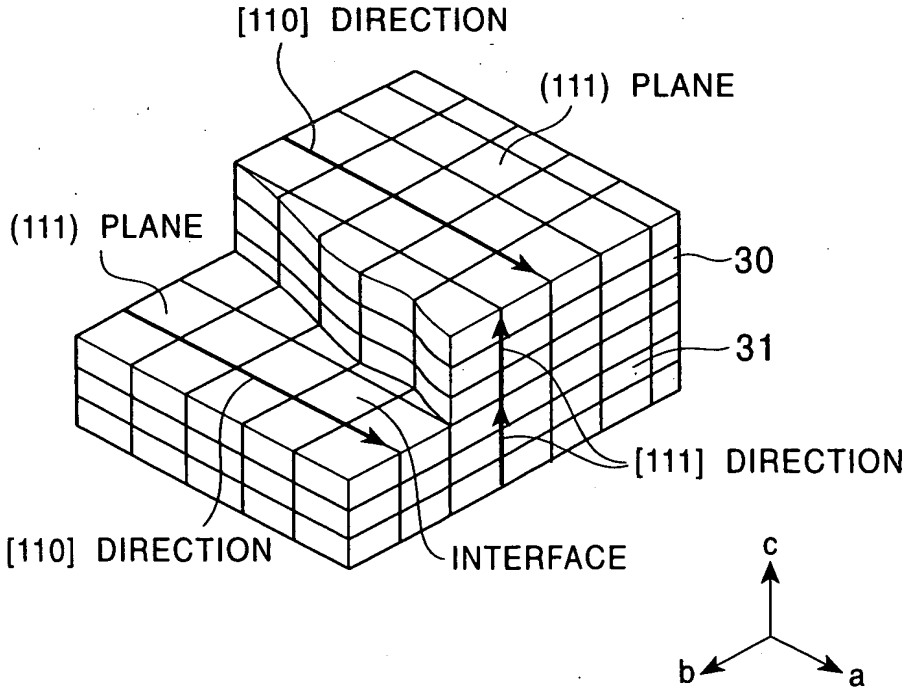

[110] DIRECTION
(111) PLANE
(111) PLANE
30
31
[111] DIRECTION
[110] DIRECTION
INTERFACE
c
b
a

FIG. 16

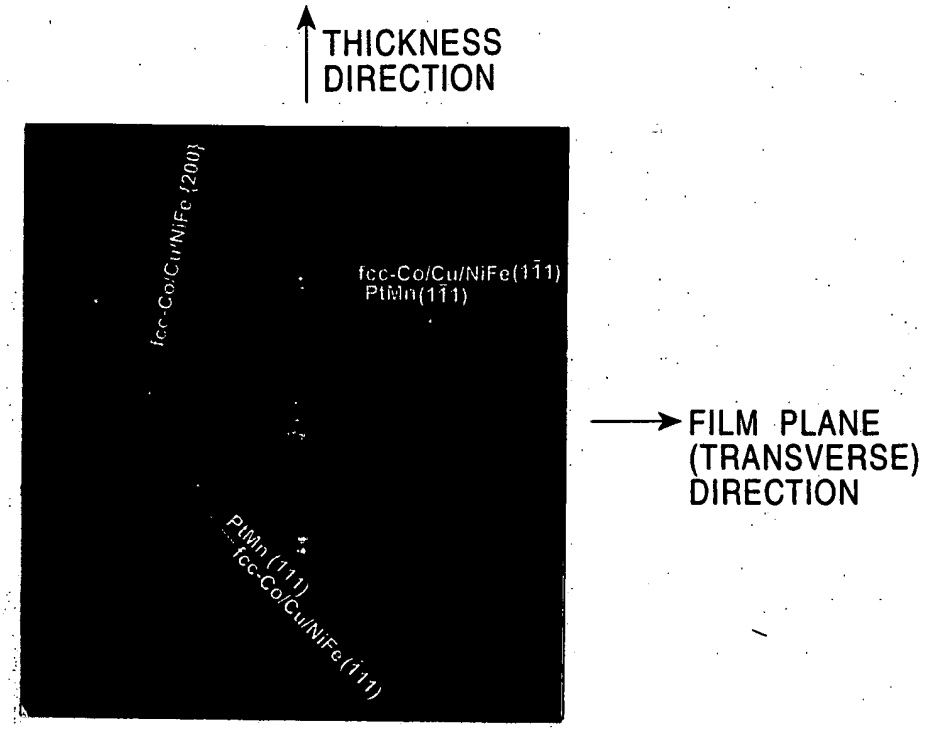

THICKNESS DIRECTION
fcc-Co/Cu/NiFe {200}
fcc-Co/Cu/NiFe(1$\bar{1}$1)
PtMn(1$\bar{1}$1)
PtMn (111)
fcc-Co/Cu/NiFe(111)
FILM PLANE (TRANSVERSE) DIRECTION

FIG. 17

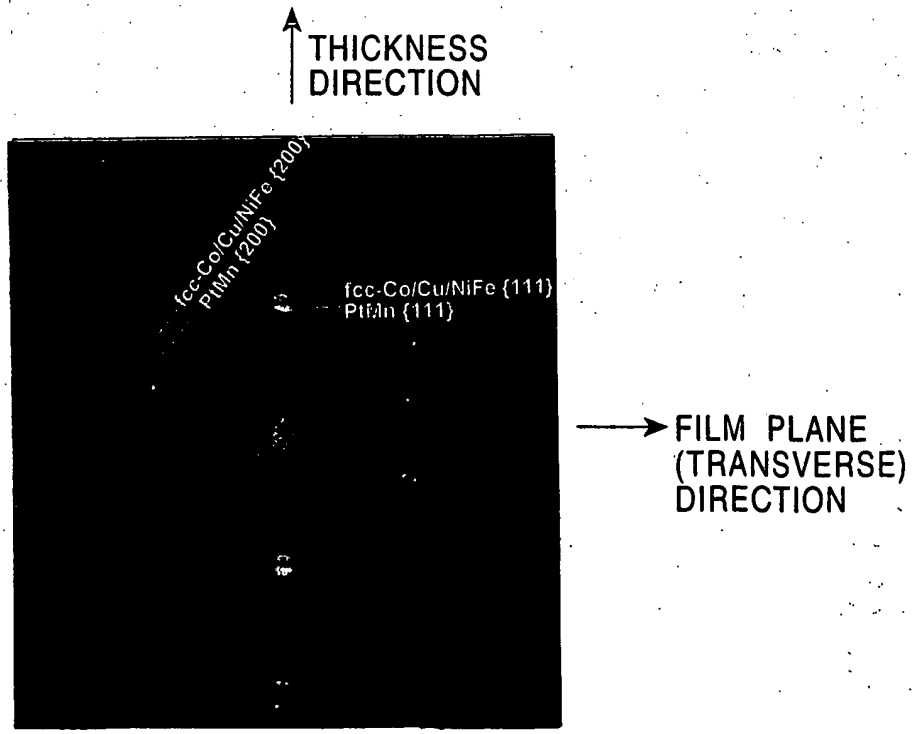

THICKNESS DIRECTION
fcc-Co/Cu/NiFe {200}
PtMn {200}
fcc-Co/Cu/NiFe {111}
PtMn {111}
FILM PLANE (TRANSVERSE) DIRECTION

FIG. 18

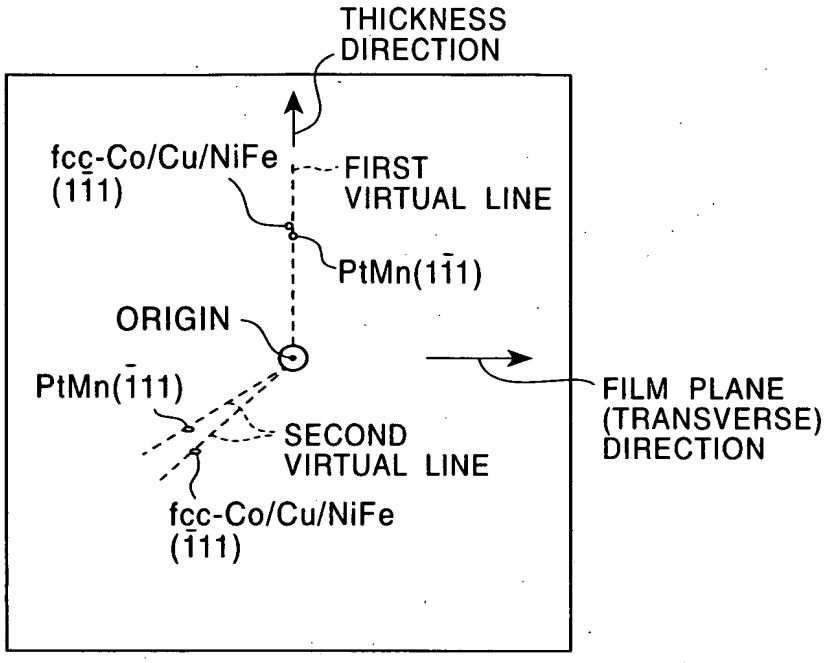

THICKNESS DIRECTION
fcc-Co/Cu/NiFe (1̄11)
FIRST VIRTUAL LINE
PtMn(1̄11)
ORIGIN
PtMn(1̄11)
FILM PLANE (TRANSVERSE) DIRECTION
SECOND VIRTUAL LINE
fcc-Co/Cu/NiFe (1̄11)

FIG. 19

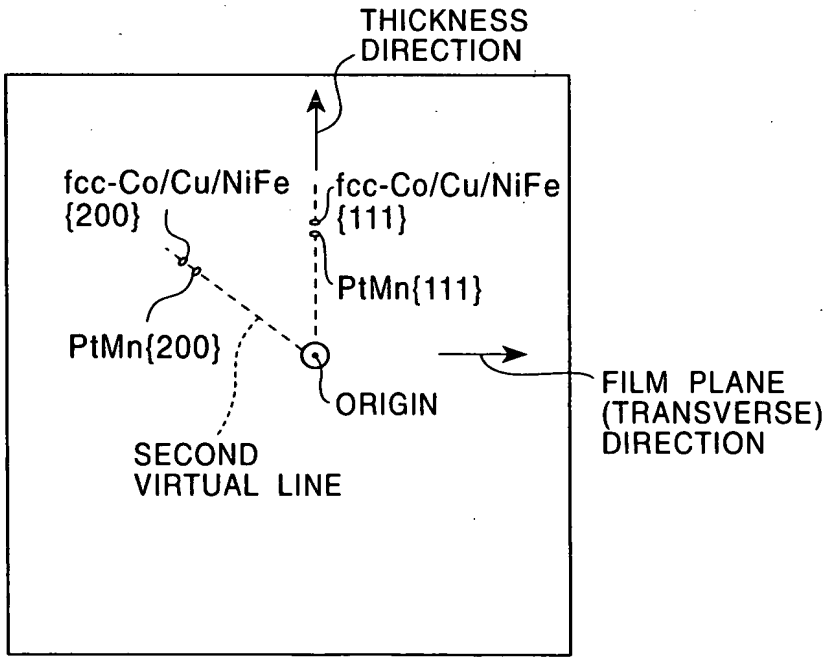

THICKNESS DIRECTION
fcc-Co/Cu/NiFe {200}
fcc-Co/Cu/NiFe {111}
PtMn{111}
PtMn{200}
ORIGIN
FILM PLANE (TRANSVERSE) DIRECTION
SECOND VIRTUAL LINE

FIG. 20

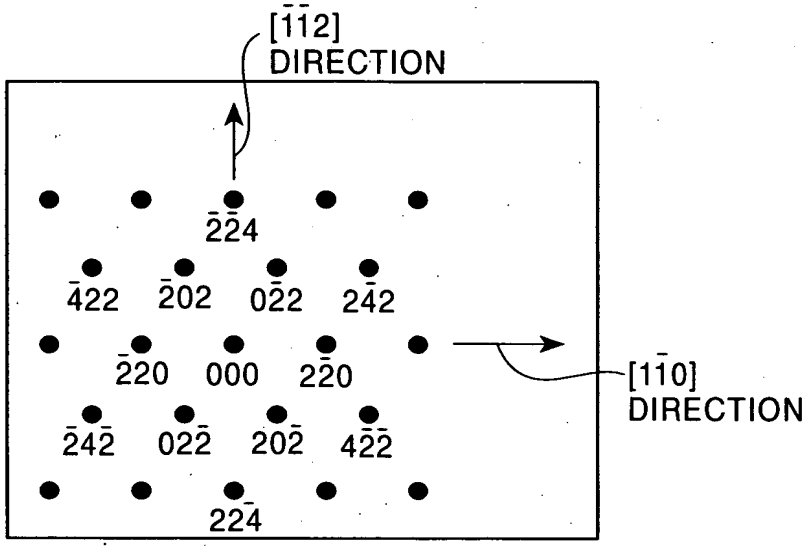

[$\bar{1}\bar{1}2$] DIRECTION
$\bar{2}\bar{2}4$
$\bar{4}22$ $\bar{2}02$ $02\bar{2}$ $24\bar{2}$
$\bar{2}20$ 000 $2\bar{2}0$
$\bar{2}4\bar{2}$ $02\bar{2}$ $20\bar{2}$ $4\bar{2}\bar{2}$
$22\bar{4}$
[$1\bar{1}0$] DIRECTION

FIG. 21

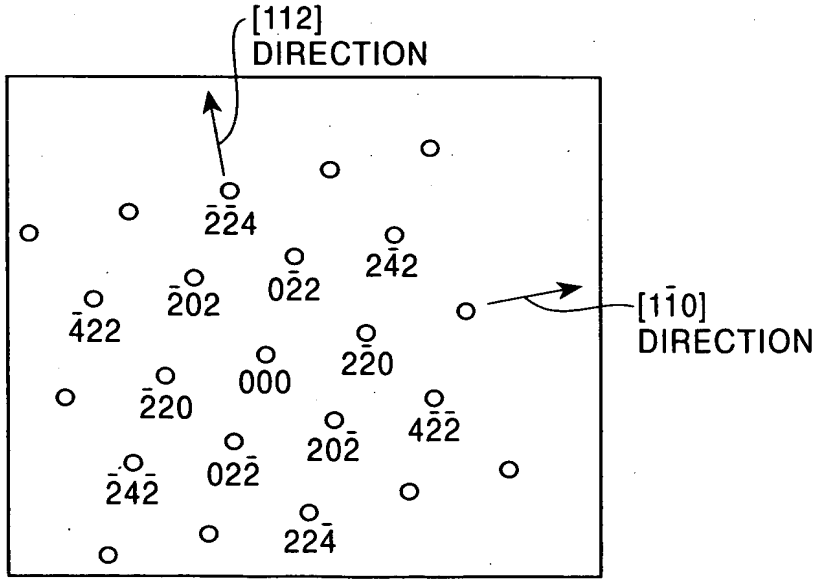

[$\bar{1}\bar{1}2$] DIRECTION
$\bar{2}\bar{2}4$
$24\bar{2}$
$\bar{4}22$ $\bar{2}02$ $02\bar{2}$
$\bar{2}20$ 000 $2\bar{2}0$
$\bar{2}20$ $4\bar{2}\bar{2}$
$\bar{2}4\bar{2}$ $02\bar{2}$ $20\bar{2}$
$22\bar{4}$
[$1\bar{1}0$] DIRECTION

FIG. 22

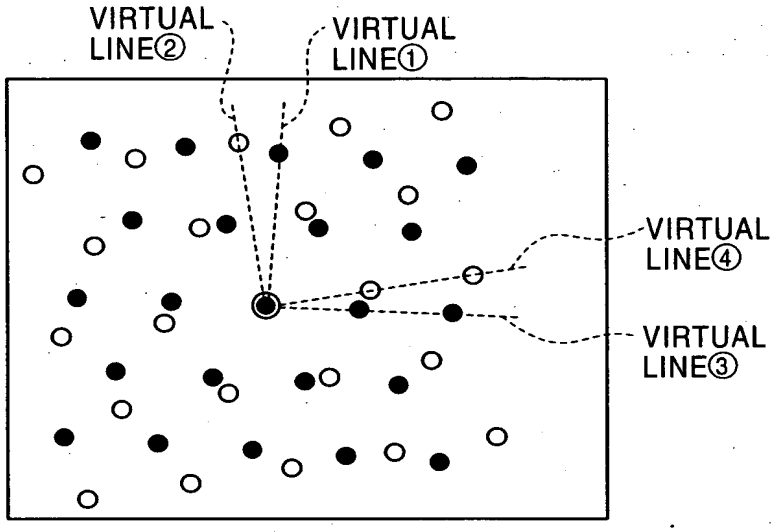

VIRTUAL LINE②
VIRTUAL LINE①
VIRTUAL LINE④
VIRTUAL LINE③

FIG. 23

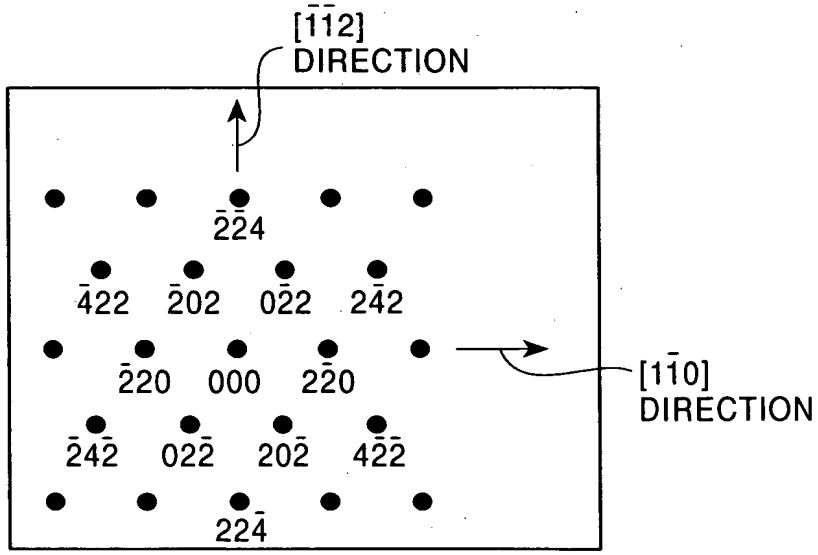

[$\bar{1}\bar{1}$2] DIRECTION
$\bar{2}\bar{2}$4
$\bar{4}$22 $\bar{2}$02 0$\bar{2}$2 2$\bar{4}\bar{2}$
$\bar{2}$20 000 2$\bar{2}$0
$\bar{2}\bar{4}\bar{2}$ 0$\bar{2}\bar{2}$ 20$\bar{2}$ 4$\bar{2}\bar{2}$
22$\bar{4}$
[1$\bar{1}$0] DIRECTION

FIG. 24

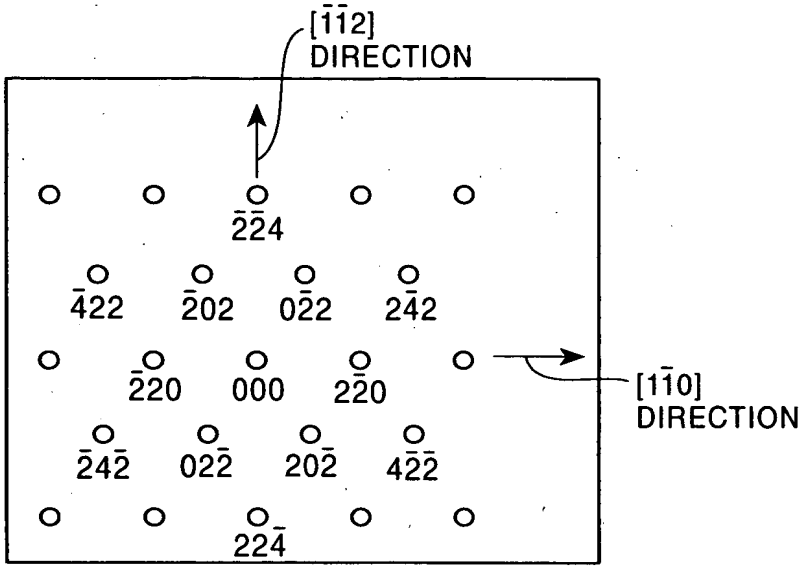

[$\bar{1}\bar{1}$2]
DIRECTION
$\bar{2}\bar{2}$4
$\bar{4}$22
$\bar{2}$02
0$\bar{2}$2
2$\bar{4}$2
$\bar{2}$20
000
2$\bar{2}$0
$\bar{2}$4$\bar{2}$
02$\bar{2}$
20$\bar{2}$
4$\bar{2}\bar{2}$
22$\bar{4}$
[1$\bar{1}$0]
DIRECTION

FIG. 25

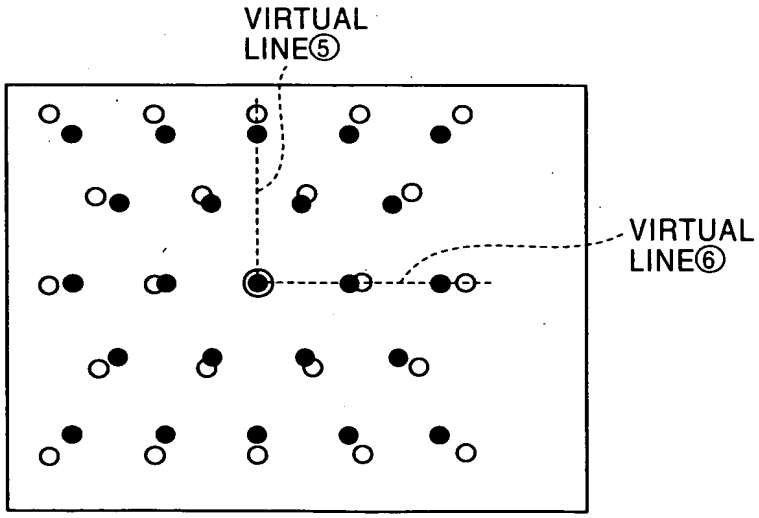

VIRTUAL
LINE⑤
VIRTUAL
LINE⑥

FIG. 26

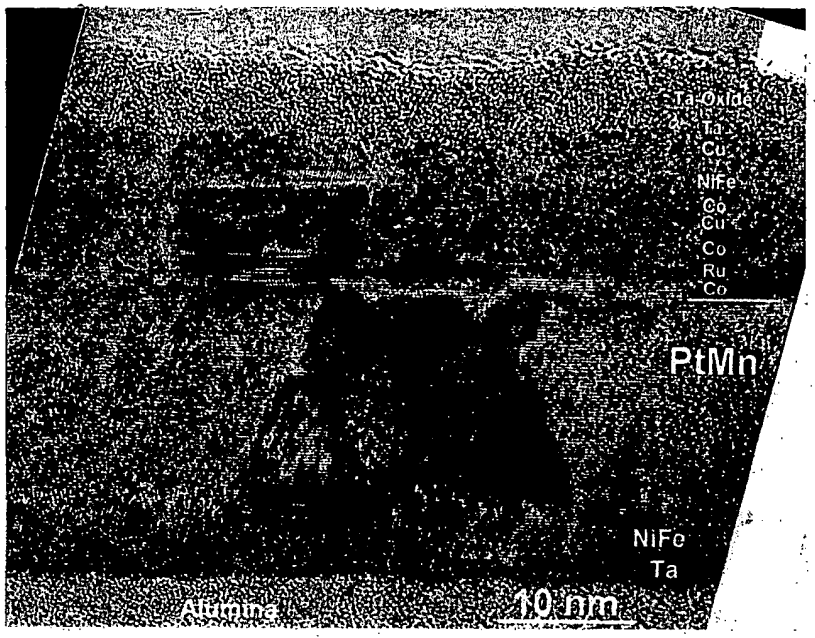

Ta-Oxide
Ta
Cu
NiFe
Co
Cu
Co
Ru
Co
PtMn
NiFe
Ta
Alumina
10 nm

FIG. 27

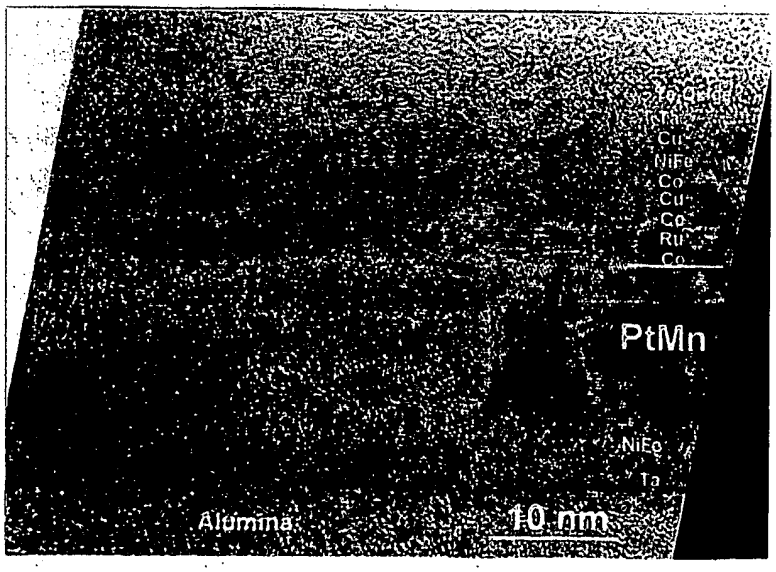

Ta
Cu
NiFe
Co
Cu
Co
Ru
Co
PtMn
NiFe
Ta
Alumina
10 nm

FIG. 28

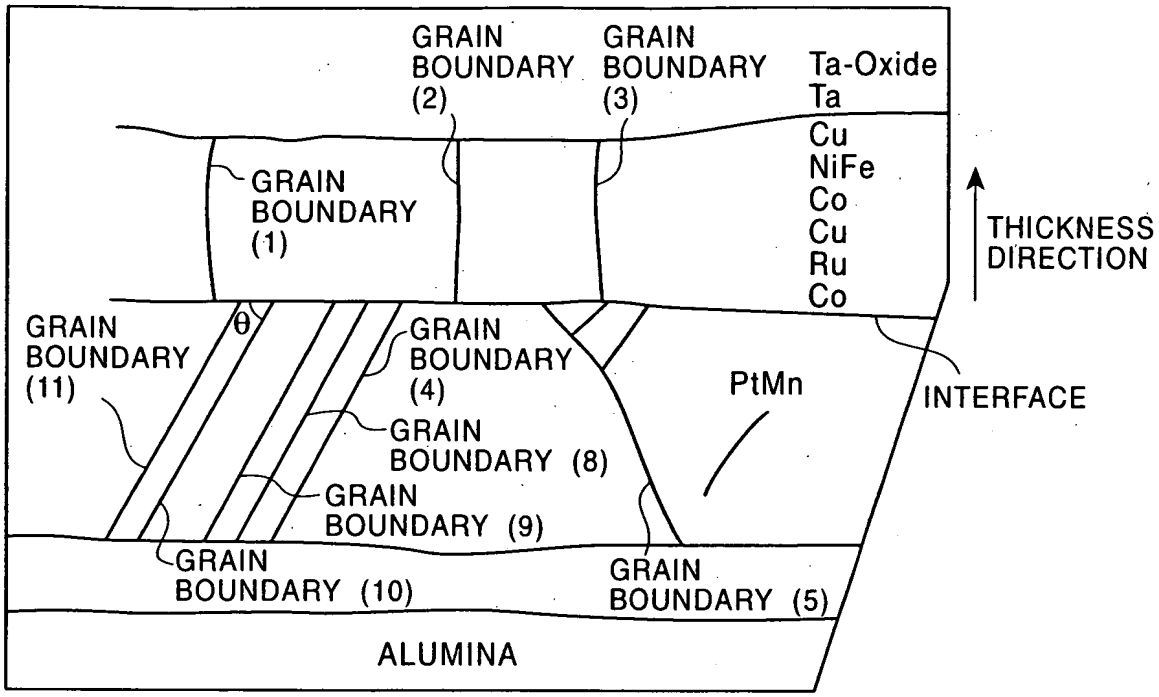

GRAIN BOUNDARY (2)
GRAIN BOUNDARY (3)
Ta-Oxide Ta
Cu
NiFe
Co
Cu
Ru
Co
THICKNESS DIRECTION
GRAIN BOUNDARY (1)
GRAIN BOUNDARY (11)
θ
GRAIN BOUNDARY (4)
GRAIN BOUNDARY (8)
GRAIN BOUNDARY (9)
PtMn
INTERFACE
GRAIN BOUNDARY (10)
GRAIN BOUNDARY (5)
ALUMINA

FIG. 29

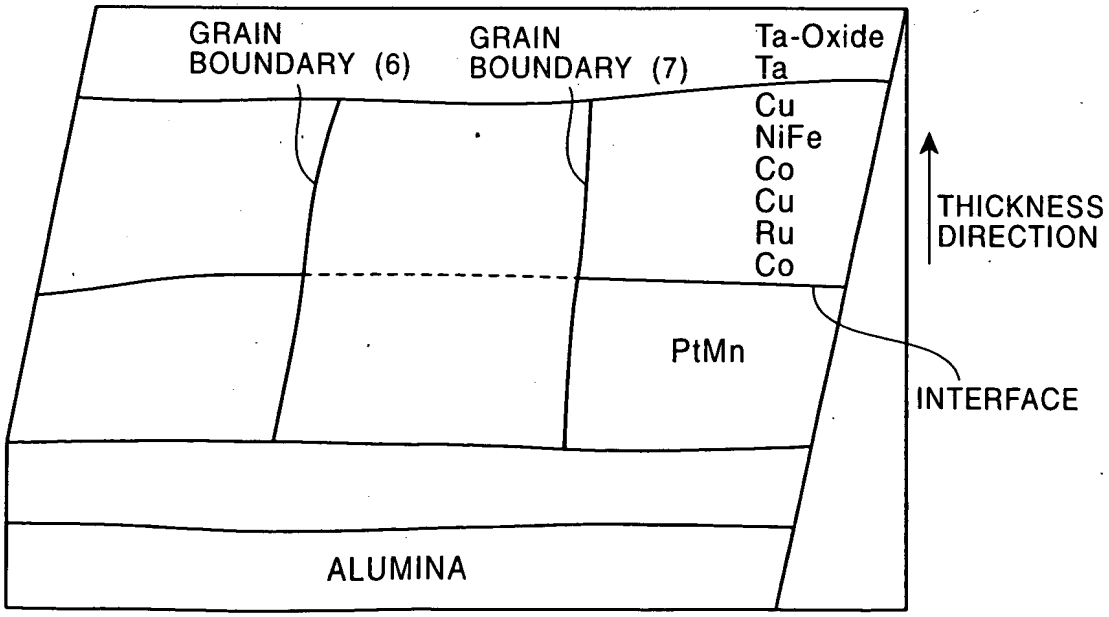

GRAIN BOUNDARY (6)
GRAIN BOUNDARY (7)
Ta-Oxide Ta
Cu
NiFe
Co
Cu
Ru
Co
THICKNESS DIRECTION
PtMn
INTERFACE
ALUMINA

FIG. 30

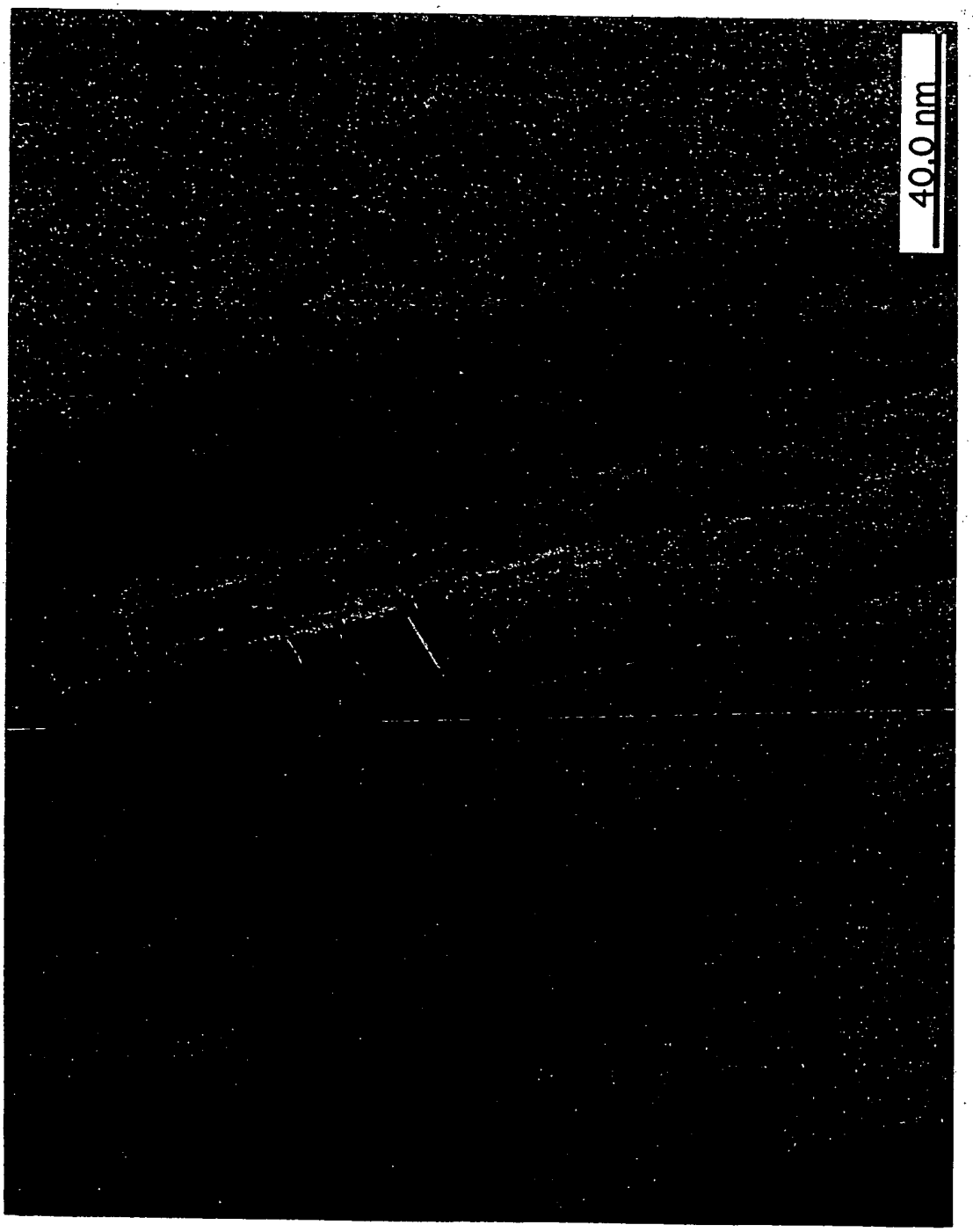


FIG. 31